U.S. Department of Agriculture
Agricultural Research Service

National Seed Storage Laboratory

The National Seed Storage Laboratory

The need to preserve genetic diversity in plants is compelling; preservation benefits human welfare directly and indirectly. Not only do plant species satisfy basic human needs; they support many biological processes essential to human survival and progress. Furthermore, advanced industrial development rests on the foundation of an adequate food supply and the availability of crops.

Our exceptionally productive crop sector was founded almost exclusively on plant genetic resources introduced from centers of diversity outside the United States. Native species of economic importance include sunflower, cranberry, blueberry, strawberry, pecan, some grasses, and a few others.

National Seed
Storage Laboratory
Fort Collins, Colorado 80521-4500

Front panel: Retrieving a seed sample from one of NSSL's 48 movable cold storage vault carriages.

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The National Seed Storage Laboratory (NSSL) has been in operation since 1958. The 82,000 square foot expansion, which was completed in 1992, provides storage space for more than 1 million samples.

The NSSL is part of the National Plant Germplasm System (NPGS). The NPGS is a network of cooperating institutions, agencies, and research units in the Federal, State, and private sectors. Its mission is to:

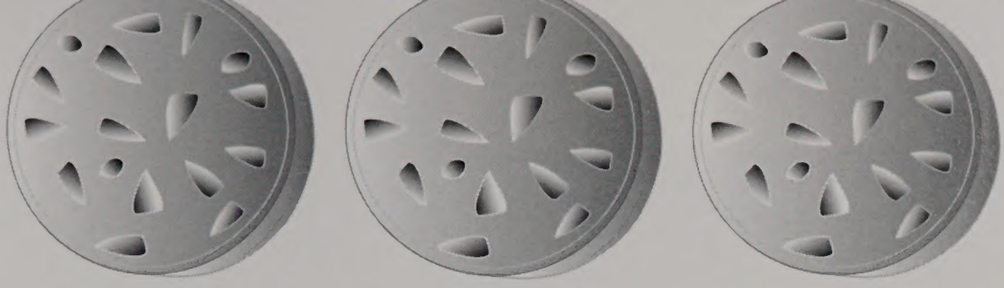
Effectively collect, document, preserve, evaluate, enhance, and distribute plant genetic resources for continued improvement in the quality and production of economic crops important to U.S. and world agriculture.

Checking the quality of cereal germplasm before storage.

This mission is achieved through a coordinated effort by the U.S. Department of Agriculture in cooperation with other organizations. The NPGS's plant genetic resources are made freely available to all bona fide users for the benefit of humankind.

The NPGS, which is a user-driven system, maintains more than 440,000 specimens, or accessions. From 1990 to 1994, the NPGS distributed an average of 124,500 samples per year to the following: U.S. public scientists (51 percent), U.S. private industry scientists (18 percent), foreign scientists (29 percent), international centers and the U.S. Agency for International Development (2 percent).

Conservation and utilization of plant genetic resources have been the foundation for improvement of agronomic, horticultural, and ornamental crops. Research scientists have used plant introductions and other source materials to develop new cultivars for our major agronomic crops. Some of these have more desirable nutritional or fiber qualities, while others are short-statured, fertilizer-responsive, resistant, or able to tolerate diseases, insect pests, and other stresses. For example, 82 percent of wheat varieties released in the United States since 1976 were developed in the United States with parents introduced after 1920 or were grown as direct introductions. These plant breeding programs and the use of improved varieties



have helped make it possible for the average American family to spend less than 12 percent of its income for food.

The mission of the NSSL is to:

Preserve the base collection of the NPGS and to conduct research to develop new technologies for preservation of seed and other propagules of plant genetic resources. Long-term preservation of duplicate samples of all accessions maintained in active collections at National Germplasm Repositories (NGR) is the goal of NSSL.

The NSSL maintains a close working relationship with genetic resource preservation programs in many countries, with International Agricultural Research Centers, and with the United Nations affiliated Food and Agricultural Organization. Because it is a center of excellence in seed physiology, cryopreservation, and conventional preservation of germplasm, scientists from all over the world come to NSSL for training and collaboration.

Manually filling a cryotank with liquid nitrogen.

Long-term Plant Germplasm Preservation

- As seed accessions are regenerated by NGR's, samples are divided for the active collection and the NSSL base collection.

- Seeds are dried to optimum moisture content for storage, evaluated for quality, and stored at –18° C, or in liquid nitrogen; and viability is periodically monitored.

- Inadequate technology limits long-term preservation of clonal germplasm, but pilot cryopreservation projects have been initiated on apple buds and mint shoot tips.

- The NSSL base collection inventory, maintained on the Germplasm Resources Information Network (GRIN) database, is available to scientists worldwide. But distributions are made from active collections by the NGR's.

- NSSL also stores voucher specimens of cultivars from the USDA-AMS Plant Variety Protection Office, security backup samples from some international centers, and seed of a few endangered species.

Preparing apple buds for cryostorage.

Plant Germplasm Preservation Research

- Research studies focus on development of new and improved technologies for long-term preservation of all forms of plant germplasm. This research is expected to increase the number of species that can be stored at NSSL, longevity of accessions, and efficiency of viability testing of accessions.

- The longer storage periods and reduced number of field and/or greenhouse regeneration cycles will result in lower costs and greater genetic integrity of the germplasm.

- The basic research will add to our understanding of cryobiology and seed/cell aging through greater insights into the basic biological/biochemical processes in cells and their responses to desiccation and low-temperature stress.

- Research scientists at NSSL work closely with all components of the NPGS.

The ARS Mission

As the in-house research arm of the U.S. Department of Agriculture, the Agricultural Research Service has a mission to:

Develop new knowledge and technology needed to solve technical agricultural problems of broad scope and high national priority in order to ensure adequate production of high-quality food, fiber, and other agricultural products to meet the nutritional needs of the American consumer, to sustain a viable food and agricultural economy, and to maintain a quality environment and natural resource base.

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